

SEQUENCE LISTING

<110> BUTTCHER, Volker et al.

<120> Method for producing alpha-1, 6-branched alpha-1, 4-glucans from sucrose

<130> 0147-0253P

<140>

<141> 2003-11-10

<150> US 09/807,063

<151> 2001-04-09`

<160> 34

<170> PatentIn Ver. 2.1

<210> 1

<211> 2475

<212> DNA

<213> Neisseria denitrificans

<220>

<221> CDS

<222> (170) .. (2458)

<400> 1

actgtatgcc gtgcagctgg aaaacctgct gggcgtagcg gacaacctca atattcccgg 60

cgtggccgaa ggctatccga actgggcgcg caaatgccg cagcctctgg aagcctttgc 120

ccgccacccg caaatgggca agcagcttgc catgatggga gacatccgc atg aac cga 178

Met Asn Arg

1

aac cgc cat atc cga cgc ggc tac cac ccg gaa gcc gga gaa cgc caa 226

Asn Arg His Ile Arg Arg Gly Tyr His Pro Glu Ala Gly Glu Arg Gln

5

10

15

atc atc gac agc ctg ttt gcc gcc acc cac agc gat ccg ttt gcc tat 274

Ile Ile Asp Ser Leu Phe Ala Ala Thr His Ser Asp Pro Phe Ala Tyr

20

25

30

35

ctt ggg cgg cat cgt gtc aac gac gaa cgc gaa gcc gtg cgc gtg ctg 322

Leu Gly Arg His Arg Val Asn Asp Glu Arg Glu Ala Val Arg Val Leu

40

45

50

cgt ccc gac gcg cac cac atc gac atc atc gac cgc cac aca ggc gca 370

Arg Pro Asp Ala His His Ile Asp Ile Ile Asp Arg His Thr Gly Ala

55

60

65

gtc atc atg ccg tct gaa aaa atc gac gag cgc ggc ctg ttt gcc gcc 418

Val Ile Met Pro Ser Glu Lys Ile Asp Glu Arg Gly Leu Phe Ala Ala

70

75

80

gta ttg ccc gaa cac gcg ccc gac tac gcc ctg ctg gtg aca tac cac	466
Val Leu Pro Glu His Ala Pro Asp Tyr Ala Leu Leu Val Thr Tyr His	
85 90 95	
gag ggc gaa gcc gcc gta cgc gaa gaa gat gac tac cgc ttc ggc agc	514
Glu Gly Glu Ala Ala Val Arg Glu Glu Asp Asp Tyr Arg Phe Gly Ser	
100 105 110 115	
gcg ctg caa cat acc gat gcc tgg ctg ctg ggc gaa ggc acg cac ctg	562
Ala Leu Gln His Thr Asp Ala Trp Leu Leu Gly Glu Gly Thr His Leu	
120 125 130	
cgc cct tat gaa acg ctg ggc gca cat ttc gcc gaa atg gac ggc gta	610
Arg Pro Tyr Glu Thr Leu Gly Ala His Phe Ala Glu Met Asp Gly Val	
135 140 145	
tcc ggc gtg cgc ttt gcc gtt tgg gcg ccc aac gcg cgg cgg gta tcg	658
Ser Gly Val Arg Phe Ala Val Trp Ala Pro Asn Ala Arg Arg Val Ser	
150 155 160	
gtc atc ggc gaa ttc aac ggc tgg gac agc cgc cgc cat gcc atg cgt	706
Val Ile Gly Glu Phe Asn Gly Trp Asp Ser Arg Arg His Ala Met Arg	
165 170 175	
ccg cac aca ggc aac ggc ctg tgg gac atc ttt atc ccc ggc gtc ggc	754
Pro His Thr Gly Asn Gly Leu Trp Asp Ile Phe Ile Pro Gly Val Gly	
180 185 190 195	
ctc aac gcg ctg tat aaa ttc tcc gta ctc gat gcc aac ggc aac atc	802
Leu Asn Ala Leu Tyr Lys Phe Ser Val Leu Asp Ala Asn Gly Asn Ile	
200 205 210	
gcg gaa aaa gcc gac ccc tac gca ttc ggc gcg gag ctg cgc ccg acc	850
Arg Glu Lys Ala Asp Pro Tyr Ala Phe Gly Ala Glu Leu Arg Pro Thr	
215 220 225	
acc gca tcc gtg gtg cgc ggc ttg ccg gcc aaa gcc gaa gcg ccc gct	898
Thr Ala Ser Val Val Arg Gly Leu Pro Ala Lys Ala Glu Ala Pro Ala	
230 235 240	
ttc cgc cgc cgc gcc aac tcc gtg gaa gcg ccc atc agc att tac gaa	946
Phe Arg Arg Arg Ala Asn Ser Val Glu Ala Pro Ile Ser Ile Tyr Glu	
245 250 255	
gtc cat ctc ggc tcg tgg cgg cgc aat ccc gaa aac aac tac tgg ctc	994
Val His Leu Gly Ser Trp Arg Arg Asn Pro Glu Asn Asn Tyr Trp Leu	
260 265 270 275	
acc tac acg cag ctg gcc gac gaa ttg gtg aac tat gta aaa gac atg	1042
Thr Tyr Thr Gln Leu Ala Asp Glu Leu Val Asn Tyr Val Lys Asp Met	
280 285 290	
ggc ttc acc cac atc gag ctg ctg ccc ttg tcc gaa tat ccg ttc gac	1090
Gly Phe Thr His Ile Glu Leu Leu Pro Leu Ser Glu Tyr Pro Phe Asp	
295 300 305	
ggc tca tgg ggc tac caa gcc acc ggc ctg tat gca ccg acc agc cgc	1138

Gly	Ser	Trp	Gly	Tyr	Gln	Ala	Thr	Gly	Leu	Tyr	Ala	Pro	Thr	Ser	Arg	
	310						315					320				
ttc	ggc	tcg	ccc	gat	gag	ctg	aaa	gcc	ctg	att	gac	gcc	gcc	cac	gcc	1186
Phe	Gly	Ser	Pro	Asp	Glu	Leu	Lys	Ala	Leu	Ile	Asp	Ala	Ala	His	Ala	
	325					330					335					
gcc	ggc	atc	agc	gtg	att	ctc	gac	tgg	gta	gcg	ggg	cac	ttc	ccc	acc	1234
Ala	Gly	Ile	Ser	Val	Ile	Leu	Asp	Trp	Val	Ala	Gly	His	Phe	Pro	Thr	
340					345				350						355	
gac	gac	cac	ggc	ctc	aac	acc	ttc	gac	ggc	acg	gcg	ctt	tac	gaa	cac	1282
Asp	Asp	His	Gly	Leu	Asn	Thr	Phe	Asp	Gly	Thr	Ala	Leu	Tyr	Glu	His	
				360					365					370		
gcc	gac	ccg	cgc	gaa	ggc	tac	cat	cag	gat	tgg	aac	acg	ctg	att	tac	1330
Ala	Asp	Pro	Arg	Glu	Gly	Tyr	His	Gln	Asp	Trp	Asn	Thr	Leu	Ile	Tyr	
			375					380						385		
aac	ttc	ggc	cgc	aac	gaa	gtc	aaa	aac	ttc	ctg	cag	ggc	aac	gcg	ctc	1378
Asn	Phe	Gly	Arg	Asn	Glu	Val	Lys	Asn	Phe	Leu	Gln	Gly	Asn	Ala	Leu	
		390					395					400				
tac	tgg	att	gag	cgt	ttc	ggc	ttc	gac	ggc	atc	cgc	gtg	gac	gcc	gtg	1426
Tyr	Trp	Ile	Glu	Arg	Phe	Gly	Phe	Asp	Gly	Ile	Arg	Val	Asp	Ala	Val	
	405					410					415					
gcc	tcg	atg	att	tac	cgc	aac	tac	tcg	cgc	aaa	gac	ggc	gag	tgg	att	1474
Ala	Ser	Met	Ile	Tyr	Arg	Asn	Tyr	Ser	Arg	Lys	Asp	Gly	Glu	Trp	Ile	
420					425					430					435	
ccc	aac	cgc	tac	ggc	ggc	agc	gaa	aat	ctg	gaa	gcc	atc	gcc	ttt	ttg	1522
Pro	Asn	Arg	Tyr	Gly	Gly	Ser	Glu	Asn	Leu	Glu	Ala	Ile	Ala	Phe	Leu	
				440					445					450		
cgc	caa	acc	aat	gcc	gtc	tta	aaa	agc	gaa	aca	ccc	ggc	gcc	ggc	tcg	1570
Arg	Gln	Thr	Asn	Ala	Val	Leu	Lys	Ser	Glu	Thr	Pro	Gly	Ala	Gly	Ser	
			455					460					465			
ttt	gcc	gaa	gaa	tcg	act	tcc	ttt	gcc	gac	gta	acc	cgc	gaa	gcc	ggc	1618
Phe	Ala	Glu	Glu	Ser	Thr	Ser	Phe	Ala	Asp	Val	Thr	Arg	Glu	Ala	Gly	
		470					475					480				
ctg	aac	ttc	gat	ttc	aaa	tgg	aat	atg	ggc	tgg	atg	aac	gac	acc	ctg	1666
Leu	Asn	Phe	Asp	Phe	Lys	Trp	Asn	Met	Gly	Trp	Met	Asn	Asp	Thr	Leu	
	485					490					495					
cgc	tat	atg	cag	gaa	gac	ccc	gtc	cac	cgc	aaa	tac	cac	cac	ggc	aaa	1714
Arg	Tyr	Met	Gln	Glu	Asp	Pro	Val	His	Arg	Lys	Tyr	His	His	Gly	Lys	
500					505					510					515	
atg	aca	ttc	ggc	atg	atg	tac	caa	tac	agc	gaa	aac	ttc	gtt	ctg	ccc	1762
Met	Thr	Phe	Gly	Met	Met	Tyr	Gln	Tyr	Ser	Glu	Asn	Phe	Val	Leu	Pro	
				520					525					530		
ctg	tcg	cac	gac	gaa	gtg	gta	cac	ggc	aaa	cgc	tcg	ctg	ctg	ggc	aaa	1810
Leu	Ser	His	Asp	Glu	Val	Val	His	Gly	Lys	Arg	Ser	Leu	Leu	Gly	Lys	

535				540				545								
atg	ccg	ggc	gac	tgc	tgg	cag	cag	ttt	gcc	aac	ctg	cgc	gcc	tat	tac	1858
Met	Pro	Gly	Asp	Cys	Trp	Gln	Gln	Phe	Ala	Asn	Leu	Arg	Ala	Tyr	Tyr	
		550					555					560				
ggc	ttt	atg	tac	ggc	ttc	ccc	ggc	aaa	aaa	ctc	cta	ttt	atg	ggc	aac	1906
Gly	Phe	Met	Tyr	Gly	Phe	Pro	Gly	Lys	Lys	Leu	Leu	Phe	Met	Gly	Asn	
		565					570					575				
gaa	ttt	gcc	caa	ggc	cgc	gag	tgg	aat	tat	cag	gaa	gga	ctg	gat	tgg	1954
Glu	Phe	Ala	Gln	Gly	Arg	Glu	Trp	Asn	Tyr	Gln	Glu	Gly	Leu	Asp	Trp	
580					585					590					595	
cat	ctg	ctc	gac	gaa	gcg	ggc	ggc	tgg	cac	aaa	ggc	gtg	cag	gat	tat	2002
His	Leu	Leu	Asp	Glu	Ala	Gly	Gly	Trp	His	Lys	Gly	Val	Gln	Asp	Tyr	
				600					605					610		
gta	cgc	gac	ctg	aac	cac	atc	tac	acc	gcc	cac	gcc	ccg	ctc	tac	cag	2050
Val	Arg	Asp	Leu	Asn	His	Ile	Tyr	Thr	Ala	His	Ala	Pro	Leu	Tyr	Gln	
				615					620					625		
ctc	gac	cag	cag	ccc	gag	ggc	ttt	gaa	tgg	ctg	gtg	gcc	gac	gac	agc	2098
Leu	Asp	Gln	Gln	Pro	Glu	Gly	Phe	Glu	Trp	Leu	Val	Ala	Asp	Asp	Ser	
				630					635					640		
gac	aat	tcg	gta	ttc	gta	ttc	gag	cgc	cgc	gac	cgc	gca	ggc	aac	cgc	2146
Asp	Asn	Ser	Val	Phe	Val	Phe	Glu	Arg	Arg	Asp	Arg	Ala	Gly	Asn	Arg	
				645									655			
atc	atc	gtc	atc	agc	aac	ttt	acc	ccg	gtg	gtg	cgc	gaa	cac	tac	cgc	2194
Ile	Ile	Val	Ile	Ser	Asn	Phe	Thr	Pro	Val	Val	Arg	Glu	His	Tyr	Arg	
660					665							670			675	
ttc	ggc	gtc	aac	gcg	ccc	ggc	cgc	tat	acc	gaa	atc	ctg	aat	tcc	gac	2242
Phe	Gly	Val	Asn	Ala	Pro	Gly	Arg	Tyr	Thr	Glu	Ile	Leu	Asn	Ser	Asp	
				680											690	
cgc	acg	cag	tat	caa	ggc	agc	ggc	atc	gca	aac	ggc	gcg	gac	atc	acg	2290
Arg	Thr	Gln	Tyr	Gln	Gly	Ser	Gly	Ile	Ala	Asn	Gly	Ala	Asp	Ile	Thr	
				695					700					705		
gcg	gaa	aac	gtg	cct	tcg	cac	ggc	aaa	gcg	cag	tcg	ctg	agc	ctg	acc	2338
Ala	Glu	Asn	Val	Pro	Ser	His	Gly	Lys	Ala	Gln	Ser	Leu	Ser	Leu	Thr	
				710					715					720		
ctg	ccg	ccg	ctg	gcc	acg	gtc	tat	ctg	tat	cag	aaa	gcc	gcg	ccc	gca	2386
Leu	Pro	Pro	Leu	Ala	Thr	Val	Tyr	Leu	Tyr	Gln	Lys	Ala	Ala	Pro	Ala	
				725											735	
acg	gaa	att	cag	acg	gcc	ttg	cgc	gcc	gac	aag	cag	ccg	gcg	gta	aaa	2434
Thr	Glu	Ile	Gln	Thr	Ala	Leu	Arg	Ala	Asp	Lys	Gln	Pro	Ala	Val	Lys	
740					745							750			755	
gat	aag	cag	gca	aaa	gcc	aaa	taa	agcggcacca				tactgcc				2475

<210> 2

<211> 762

<212> PRT

<213> Neisseria denitrificans

<400> 2

Met Asn Arg Asn Arg His Ile Arg Arg Gly Tyr His Pro Glu Ala Gly
1 5 10 15

Glu Arg Gln Ile Ile Asp Ser Leu Phe Ala Ala Thr His Ser Asp Pro
20 25 30

Phe Ala Tyr Leu Gly Arg His Arg Val Asn Asp Glu Arg Glu Ala Val
35 40 45

Arg Val Leu Arg Pro Asp Ala His His Ile Asp Ile Ile Asp Arg His
50 55 60

Thr Gly Ala Val Ile Met Pro Ser Glu Lys Ile Asp Glu Arg Gly Leu
65 70 75 80

Phe Ala Ala Val Leu Pro Glu His Ala Pro Asp Tyr Ala Leu Leu Val
85 90 95

Thr Tyr His Glu Gly Glu Ala Ala Val Arg Glu Glu Asp Asp Tyr Arg
100 105 110

Phe Gly Ser Ala Leu Gln His Thr Asp Ala Trp Leu Leu Gly Glu Gly
115 120 125

Thr His Leu Arg Pro Tyr Glu Thr Leu Gly Ala His Phe Ala Glu Met
130 135 140

Asp Gly Val Ser Gly Val Arg Phe Ala Val Trp Ala Pro Asn Ala Arg
145 150 155 160

Arg Val Ser Val Ile Gly Glu Phe Asn Gly Trp Asp Ser Arg Arg His
165 170 175

Ala Met Arg Pro His Thr Gly Asn Gly Leu Trp Asp Ile Phe Ile Pro
180 185 190

Gly Val Gly Leu Asn Ala Leu Tyr Lys Phe Ser Val Leu Asp Ala Asn
195 200 205

Gly Asn Ile Arg Glu Lys Ala Asp Pro Tyr Ala Phe Gly Ala Glu Leu
210 215 220

Arg Pro Thr Thr Ala Ser Val Val Arg Gly Leu Pro Ala Lys Ala Glu
225 230 235 240

Ala Pro Ala Phe Arg Arg Arg Ala Asn Ser Val Glu Ala Pro Ile Ser
245 250 255

Ile Tyr Glu Val His Leu Gly Ser Trp Arg Arg Asn Pro Glu Asn Asn

260						265						270					
Tyr	Trp	Leu	Thr	Tyr	Thr	Gln	Leu	Ala	Asp	Glu	Leu	Val	Asn	Tyr	Val		
275						280						285					
Lys	Asp	Met	Gly	Phe	Thr	His	Ile	Glu	Leu	Leu	Pro	Leu	Ser	Glu	Tyr		
290						295						300					
Pro	Phe	Asp	Gly	Ser	Trp	Gly	Tyr	Gln	Ala	Thr	Gly	Leu	Tyr	Ala	Pro		
305			310						315			320					
Thr	Ser	Arg	Phe	Gly	Ser	Pro	Asp	Glu	Leu	Lys	Ala	Leu	Ile	Asp	Ala		
			325						330			335					
Ala	His	Ala	Ala	Gly	Ile	Ser	Val	Ile	Leu	Asp	Trp	Val	Ala	Gly	His		
			340						345			350					
Phe	Pro	Thr	Asp	Asp	His	Gly	Leu	Asn	Thr	Phe	Asp	Gly	Thr	Ala	Leu		
355						360						365					
Tyr	Glu	His	Ala	Asp	Pro	Arg	Glu	Gly	Tyr	His	Gln	Asp	Trp	Asn	Thr		
370						375						380					
Leu	Ile	Tyr	Asn	Phe	Gly	Arg	Asn	Glu	Val	Lys	Asn	Phe	Leu	Gln	Gly		
385			390						395			400					
Asn	Ala	Leu	Tyr	Trp	Ile	Glu	Arg	Phe	Gly	Phe	Asp	Gly	Ile	Arg	Val		
			405						410			415					
Asp	Ala	Val	Ala	Ser	Met	Ile	Tyr	Arg	Asn	Tyr	Ser	Arg	Lys	Asp	Gly		
			420						425			430					
Glu	Trp	Ile	Pro	Asn	Arg	Tyr	Gly	Gly	Ser	Glu	Asn	Leu	Glu	Ala	Ile		
435						440						445					
Ala	Phe	Leu	Arg	Gln	Thr	Asn	Ala	Val	Leu	Lys	Ser	Glu	Thr	Pro	Gly		
450						455						460					
Ala	Gly	Ser	Phe	Ala	Glu	Glu	Ser	Thr	Ser	Phe	Ala	Asp	Val	Thr	Arg		
465			470						475			480					
Glu	Ala	Gly	Leu	Asn	Phe	Asp	Phe	Lys	Trp	Asn	Met	Gly	Trp	Met	Asn		
			485						490			495					
Asp	Thr	Leu	Arg	Tyr	Met	Gln	Glu	Asp	Pro	Val	His	Arg	Lys	Tyr	His		
500						505						510					
His	Gly	Lys	Met	Thr	Phe	Gly	Met	Met	Tyr	Gln	Tyr	Ser	Glu	Asn	Phe		
515						520						525					
Val	Leu	Pro	Leu	Ser	His	Asp	Glu	Val	Val	His	Gly	Lys	Arg	Ser	Leu		
530						535						540					
Leu	Gly	Lys	Met	Pro	Gly	Asp	Cys	Trp	Gln	Gln	Phe	Ala	Asn	Leu	Arg		
545			550						555			560					
Ala	Tyr	Tyr	Gly	Phe	Met	Tyr	Gly	Phe	Pro	Gly	Lys	Lys	Leu	Leu	Phe		

565					570					575					
Met	Gly	Asn	Glu	Phe	Ala	Gln	Gly	Arg	Glu	Trp	Asn	Tyr	Gln	Glu	Gly
		580						585					590		
Leu	Asp	Trp	His	Leu	Leu	Asp	Glu	Ala	Gly	Gly	Trp	His	Lys	Gly	Val
		595					600					605			
Gln	Asp	Tyr	Val	Arg	Asp	Leu	Asn	His	Ile	Tyr	Thr	Ala	His	Ala	Pro
		610				615					620				
Leu	Tyr	Gln	Leu	Asp	Gln	Gln	Pro	Glu	Gly	Phe	Glu	Trp	Leu	Val	Ala
625					630					635					640
Asp	Asp	Ser	Asp	Asn	Ser	Val	Phe	Val	Phe	Glu	Arg	Arg	Asp	Arg	Ala
				645					650					655	
Gly	Asn	Arg	Ile	Ile	Val	Ile	Ser	Asn	Phe	Thr	Pro	Val	Val	Arg	Glu
			660					665					670		
His	Tyr	Arg	Phe	Gly	Val	Asn	Ala	Pro	Gly	Arg	Tyr	Thr	Glu	Ile	Leu
		675				680						685			
Asn	Ser	Asp	Arg	Thr	Gln	Tyr	Gln	Gly	Ser	Gly	Ile	Ala	Asn	Gly	Ala
		690				695					700				
Asp	Ile	Thr	Ala	Glu	Asn	Val	Pro	Ser	His	Gly	Lys	Ala	Gln	Ser	Leu
705					710					715					720
Ser	Leu	Thr	Leu	Pro	Pro	Leu	Ala	Thr	Val	Tyr	Leu	Tyr	Gln	Lys	Ala
				725					730					735	
Ala	Pro	Ala	Thr	Glu	Ile	Gln	Thr	Ala	Leu	Arg	Ala	Asp	Lys	Gln	Pro
			740					745					750		
Ala	Val	Lys	Asp	Lys	Gln	Ala	Lys	Ala	Lys						
		755					760								

<210> 3

<211> 6

<212> PRT

<213> Neisseria denitrificans

<220>

<221> UNSURE

<222> (5)..(5)

<223> Xaa = any amino acid, unknown or other

<400> 3

Met Asn Arg Asn Xaa His

1

5

<210> 4

<211> 2914
<212> DNA
<213> *Neisseria polysaccharea*

<220>
<221> CDS
<222> (957) .. (2867)

<400> 4
gagttttgcg ttcccgaacc gaacgtgatg cttgagccga acacctgtcc ggcaaggcgg 60
ctgaccgccc ccttttgccc catcgacatc gtaacaatcg gtttggtggc aagctctttc 120
gctttgagcg tggcagaaag caaagtcagc acgtcttccg cgctttgcgg catcaccgca 180
attttgcaga tgtccgcgcc gcagtctctc atctgtttca gacggcatac gatttcttct 240
tgcggcggcg tgcggtgaaa ctcatgattg cagagcaggg cggcgatgcc gtttttttga 300
gcatgcgcca cggcgcgccg gacggcggtt tcgccgaaa aaagctcgat atcgataatg 360
tcgggcaggc ggctttcaat cagcgagtcg agcagttcaa aataataatc gtccgaacac 420
gggaacgagc cgccttcgcc atgccgtctg aacgtaaaca gcagcggctt gtcgggcagc 480
gcgtcgcgga cggctctgct gtggcgcaat acttcgccga tgctgcccgc gcattccaaa 540
aaatcggcgc ggaactcgac gatatcgaag ggcagggttt tgatttggtc aagtacggcg 600
gaaagtacgg cggcatcgcg ggcgacaagc ggcacggcga ttttggtgcg tccgcttccg 660
ataacggtgt ttttgacggt caggctggtg tgcattggcg ttgttgcggc tgaaaggaac 720
ggtaaagacg caattatagc aaaggcacag gcaatgtttc agacggcatt tctgtgcggc 780
cggcttgata tgaatcaagc agcatccgca tatcggaatg cagacttggc acaagccctg 840
tcttttctag tcagtccgca gttcttgag tatgattgca cgacacgccc tacacggcat 900
ttgcaggata cggcggcaga ccgccggtcg gaaacttcag aatcggagca ggcac atg 959
Met
1
ttg acc ccc acg cag caa gtc ggt ttg att tta cag tac ctc aaa aca 1007
Leu Thr Pro Thr Gln Gln Val Gly Leu Ile Leu Gln Tyr Leu Lys Thr
5 10 15
cgc atc ttg gac atc tac acg ccc gaa cag cgc gcc ggc atc gaa aaa 1055
Arg Ile Leu Asp Ile Tyr Thr Pro Glu Gln Arg Ala Gly Ile Glu Lys
20 25 30
tcc gaa gac tgg cgg cag ttt tcg cgc cgc atg gat acg cat ttc ccc 1103
Ser Glu Asp Trp Arg Gln Phe Ser Arg Arg Met Asp Thr His Phe Pro
35 40 45
aaa ctg atg aac gaa ctc gac agc gtg tac ggc aac aac gaa gcc ctg 1151
Lys Leu Met Asn Glu Leu Asp Ser Val Tyr Gly Asn Asn Glu Ala Leu

50		55		60		65	
ctg cct atg ctg gaa atg ctg ctg gcg cag gca tgg caa agc tat tcc	1199						
Leu Pro Met Leu Glu Met Leu Leu Ala Gln Ala Trp Gln Ser Tyr Ser							
		70		75		80	
caa cgc aac tca tcc tta aaa gat atc gat atc gcg cgc gaa aac aac	1247						
Gln Arg Asn Ser Ser Leu Lys Asp Ile Asp Ile Ala Arg Glu Asn Asn		85		90		95	
ccc gat tgg att ttg tcc aac aaa caa gtc ggc ggc gtg tgc tac gtt	1295						
Pro Asp Trp Ile Leu Ser Asn Lys Gln Val Gly Gly Val Cys Tyr Val		100		105		110	
gat ttg ttt gcc ggc gat ttg aag ggc ttg aaa gat aaa att cct tat	1343						
Asp Leu Phe Ala Gly Asp Leu Lys Gly Leu Lys Asp Lys Ile Pro Tyr		115		120		125	
ttt caa gag ctt ggt ttg act tat ctg cac ctg atg ccg ctg ttt aaa	1391						
Phe Gln Glu Leu Gly Leu Thr Tyr Leu His Leu Met Pro Leu Phe Lys		130		135		140	
						145	
tgc cct gaa ggc aaa agc gac ggc ggc tat gcg gtc agc agc tac cgc	1439						
Cys Pro Glu Gly Lys Ser Asp Gly Gly Tyr Ala Val Ser Ser Tyr Arg		150		155		160	
gat gtc aat ccg gca ctg ggc aca ata ggc gac ttg cgc gaa gtc att	1487						
Asp Val Asn Pro Ala Leu Gly Thr Ile Gly Asp Leu Arg Glu Val Ile		165		170		175	
gct gcg ctg cac gaa gcc ggc att tcc gcc gtc gtc gat ttt atc ttc	1535						
Ala Ala Leu His Glu Ala Gly Ile Ser Ala Val Val Asp Phe Ile Phe		180		185		190	
aac cac acc tcc aac gaa cac gaa tgg gcg caa cgc tgc gcc gcc ggc	1583						
Asn His Thr Ser Asn Glu His Glu Trp Ala Gln Arg Cys Ala Ala Gly		195		200		205	
gac ccg ctt ttc gac aat ttc tac tat att ttc ccc gac cgc cgg atg	1631						
Asp Pro Leu Phe Asp Asn Phe Tyr Tyr Ile Phe Pro Asp Arg Arg Met		210		215		220	
						225	
ccc gac caa tac gac cgc acc ctg cgc gaa atc ttc ccc gac cag cac	1679						
Pro Asp Gln Tyr Asp Arg Thr Leu Arg Glu Ile Phe Pro Asp Gln His		230		235		240	
ccg ggc ggc ttc tcg caa ctg gaa gac gga cgc tgg gtg tgg acg acc	1727						
Pro Gly Gly Phe Ser Gln Leu Glu Asp Gly Arg Trp Val Trp Thr Thr		245		250		255	
ttc aat tcc ttc caa tgg gac ttg aat tac agc aac ccg tgg gta ttc	1775						
Phe Asn Ser Phe Gln Trp Asp Leu Asn Tyr Ser Asn Pro Trp Val Phe		260		265		270	
cgc gca atg gcg ggc gaa atg ctg ttc ctt gcc aac ttg ggc gtt gac	1823						
Arg Ala Met Ala Gly Glu Met Leu Phe Leu Ala Asn Leu Gly Val Asp		275		280		285	

atc ctg cgt atg gat gcg gtt gcc ttt att tgg aaa caa atg ggg aca	1871
Ile Leu Arg Met Asp Ala Val Ala Phe Ile Trp Lys Gln Met Gly Thr	
290 295 300 305	
agc tgc gaa aac ctg ccg cag gcg cac gcc ctc atc cgc gcg ttc aat	1919
Ser Cys Glu Asn Leu Pro Gln Ala His Ala Leu Ile Arg Ala Phe Asn	
310 315 320	
gcc gtt atg cgt att gcc gcg ccc gcc gtg ttc ttc aaa tcc gaa gcc	1967
Ala Val Met Arg Ile Ala Ala Pro Ala Val Phe Phe Lys Ser Glu Ala	
325 330 335	
atc gtc cac ccc gac caa gtc gtc caa tac atc ggg cag gac gaa tgc	2015
Ile Val His Pro Asp Gln Val Val Gln Tyr Ile Gly Gln Asp Glu Cys	
340 345 350	
caa atc ggt tac aac ccc ctg caa atg gca ttg ttg tgg aac acc ctt	2063
Gln Ile Gly Tyr Asn Pro Leu Gln Met Ala Leu Leu Trp Asn Thr Leu	
355 360 365	
gcc acg cgc gaa gtc aac ctg ctc cat cag gcg ctg acc tac cgc cac	2111
Ala Thr Arg Glu Val Asn Leu Leu His Gln Ala Leu Thr Tyr Arg His	
370 375 380 385	
aac ctg ccc gag cat acc gcc tgg gtc aac tac gtc cgc agc cac gac	2159
Asn Leu Pro Glu His Thr Ala Trp Val Asn Tyr Val Arg Ser His Asp	
390 395 400	
gac atc ggc tgg acg ttt gcc gat gaa gac gcg gca tat ctg ggc ata	2207
Asp Ile Gly Trp Thr Phe Ala Asp Glu Asp Ala Ala Tyr Leu Gly Ile	
405 410 415	
agc ggc tac gac cac cgc caa ttc ctc aac cgc ttc ttc gtc aac cgt	2255
Ser Gly Tyr Asp His Arg Gln Phe Leu Asn Arg Phe Phe Val Asn Arg	
420 425 430	
ttc gac ggc agc ttc gct cgt ggc gta ccg ttc caa tac aac cca agc	2303
Phe Asp Gly Ser Phe Ala Arg Gly Val Pro Phe Gln Tyr Asn Pro Ser	
435 440 445	
aca ggc gac tgc cgt gtc agt ggt aca gcc gcg gca ttg gtc ggc ttg	2351
Thr Gly Asp Cys Arg Val Ser Gly Thr Ala Ala Ala Leu Val Gly Leu	
450 455 460 465	
gcg caa gac gat ccc cac gcc gtt gac cgc atc aaa ctc ttg tac agc	2399
Ala Gln Asp Asp Pro His Ala Val Asp Arg Ile Lys Leu Leu Tyr Ser	
470 475 480	
att gct ttg agt acc ggc ggt ctg ccg ctg att tac cta ggc gac gaa	2447
Ile Ala Leu Ser Thr Gly Gly Leu Pro Leu Ile Tyr Leu Gly Asp Glu	
485 490 495	
gtg ggt acg ctc aat gac gac gac tgg tcg caa gac agc aat aag agc	2495
Val Gly Thr Leu Asn Asp Asp Asp Trp Ser Gln Asp Ser Asn Lys Ser	
500 505 510	

gac gac agc cgt tgg gcg cac cgt ccg cgc tac aac gaa gcc ctg tac	2543
Asp Asp Ser Arg Trp Ala His Arg Pro Arg Tyr Asn Glu Ala Leu Tyr	
515 520 525	
gcg caa cgc aac gat ccg tcg acc gca gcc ggg caa atc tat cag ggc	2591
Ala Gln Arg Asn Asp Pro Ser Thr Ala Ala Gly Gln Ile Tyr Gln Gly	
530 535 540 545	
ttg cgc cat atg att gcc gtc cgc caa agc aat ccg cgc ttc gac ggc	2639
Leu Arg His Met Ile Ala Val Arg Gln Ser Asn Pro Arg Phe Asp Gly	
550 555 560	
ggc agg ctg gtt aca ttc aac acc aac aac aag cac atc atc ggc tac	2687
Gly Arg Leu Val Thr Phe Asn Thr Asn Asn Lys His Ile Ile Gly Tyr	
565 570 575	
atc cgc aac aat gcg ctt ttg gca ttc ggt aac ttc agc gaa tat ccg	2735
Ile Arg Asn Asn Ala Leu Leu Ala Phe Gly Asn Phe Ser Glu Tyr Pro	
580 585 590	
caa acc gtt acc gcg cat acc ctg caa gcc atg ccc ttc aag gcg cac	2783
Gln Thr Val Thr Ala His Thr Leu Gln Ala Met Pro Phe Lys Ala His	
595 600 605	
gac ctc atc ggt ggc aaa act gtc agc ctg aat cag gat ttg acg ctt	2831
Asp Leu Ile Gly Gly Lys Thr Val Ser Leu Asn Gln Asp Leu Thr Leu	
610 615 620 625	
cag ccc tat cag gtc atg tgg ctc gaa atc gcc tga cgcacgcttc	2877
Gln Pro Tyr Gln Val Met Trp Leu Glu Ile Ala	
630 635	
ccaaatgccg tctgaaccgt ttcagacggc atttgcg	2914

<210> 5

<211> 636

<212> PRT

<213> Neisseria polysaccharea

<400> 5

Met Leu Thr Pro Thr Gln Gln Val Gly Leu Ile Leu Gln Tyr Leu Lys	
1 5 10 15	
Thr Arg Ile Leu Asp Ile Tyr Thr Pro Glu Gln Arg Ala Gly Ile Glu	
20 25 30	
Lys Ser Glu Asp Trp Arg Gln Phe Ser Arg Arg Met Asp Thr His Phe	
35 40 45	
Pro Lys Leu Met Asn Glu Leu Asp Ser Val Tyr Gly Asn Asn Glu Ala	
50 55 60	
Leu Leu Pro Met Leu Glu Met Leu Leu Ala Gln Ala Trp Gln Ser Tyr	
65 70 75 80	
Ser Gln Arg Asn Ser Ser Leu Lys Asp Ile Asp Ile Ala Arg Glu Asn	

85					90					95					
Asn	Pro	Asp	Trp	Ile	Leu	Ser	Asn	Lys	Gln	Val	Gly	Gly	Val	Cys	Tyr
			100					105					110		
Val	Asp	Leu	Phe	Ala	Gly	Asp	Leu	Lys	Gly	Leu	Lys	Asp	Lys	Ile	Pro
		115					120					125			
Tyr	Phe	Gln	Glu	Leu	Gly	Leu	Thr	Tyr	Leu	His	Leu	Met	Pro	Leu	Phe
	130					135					140				
Lys	Cys	Pro	Glu	Gly	Lys	Ser	Asp	Gly	Gly	Tyr	Ala	Val	Ser	Ser	Tyr
145					150					155					160
Arg	Asp	Val	Asn	Pro	Ala	Leu	Gly	Thr	Ile	Gly	Asp	Leu	Arg	Glu	Val
				165					170					175	
Ile	Ala	Ala	Leu	His	Glu	Ala	Gly	Ile	Ser	Ala	Val	Val	Asp	Phe	Ile
			180					185					190		
Phe	Asn	His	Thr	Ser	Asn	Glu	His	Glu	Trp	Ala	Gln	Arg	Cys	Ala	Ala
		195					200					205			
Gly	Asp	Pro	Leu	Phe	Asp	Asn	Phe	Tyr	Tyr	Ile	Phe	Pro	Asp	Arg	Arg
	210					215					220				
Met	Pro	Asp	Gln	Tyr	Asp	Arg	Thr	Leu	Arg	Glu	Ile	Phe	Pro	Asp	Gln
225				230						235					240
His	Pro	Gly	Gly	Phe	Ser	Gln	Leu	Glu	Asp	Gly	Arg	Trp	Val	Trp	Thr
			245						250					255	
Thr	Phe	Asn	Ser	Phe	Gln	Trp	Asp	Leu	Asn	Tyr	Ser	Asn	Pro	Trp	Val
			260					265					270		
Phe	Arg	Ala	Met	Ala	Gly	Glu	Met	Leu	Phe	Leu	Ala	Asn	Leu	Gly	Val
		275					280					285			
Asp	Ile	Leu	Arg	Met	Asp	Ala	Val	Ala	Phe	Ile	Trp	Lys	Gln	Met	Gly
	290					295					300				
Thr	Ser	Cys	Glu	Asn	Leu	Pro	Gln	Ala	His	Ala	Leu	Ile	Arg	Ala	Phe
305				310					315					320	
Asn	Ala	Val	Met	Arg	Ile	Ala	Ala	Pro	Ala	Val	Phe	Phe	Lys	Ser	Glu
			325					330						335	
Ala	Ile	Val	His	Pro	Asp	Gln	Val	Val	Gln	Tyr	Ile	Gly	Gln	Asp	Glu
		340					345						350		
Cys	Gln	Ile	Gly	Tyr	Asn	Pro	Leu	Gln	Met	Ala	Leu	Leu	Trp	Asn	Thr
	355					360						365			
Leu	Ala	Thr	Arg	Glu	Val	Asn	Leu	Leu	His	Gln	Ala	Leu	Thr	Tyr	Arg
	370					375					380				
His	Asn	Leu	Pro	Glu	His	Thr	Ala	Trp	Val	Asn	Tyr	Val	Arg	Ser	His

385		390		395		400									
Asp	Asp	Ile	Gly	Trp	Thr	Phe	Ala	Asp	Glu	Asp	Ala	Ala	Tyr	Leu	Gly
			405						410					415	
Ile	Ser	Gly	Tyr	Asp	His	Arg	Gln	Phe	Leu	Asn	Arg	Phe	Phe	Val	Asn
			420					425					430		
Arg	Phe	Asp	Gly	Ser	Phe	Ala	Arg	Gly	Val	Pro	Phe	Gln	Tyr	Asn	Pro
		435					440					445			
Ser	Thr	Gly	Asp	Cys	Arg	Val	Ser	Gly	Thr	Ala	Ala	Ala	Leu	Val	Gly
	450					455					460				
Leu	Ala	Gln	Asp	Asp	Pro	His	Ala	Val	Asp	Arg	Ile	Lys	Leu	Leu	Tyr
465					470				475						480
Ser	Ile	Ala	Leu	Ser	Thr	Gly	Gly	Leu	Pro	Leu	Ile	Tyr	Leu	Gly	Asp
			485					490						495	
Glu	Val	Gly	Thr	Leu	Asn	Asp	Asp	Asp	Trp	Ser	Gln	Asp	Ser	Asn	Lys
		500					505					510			
Ser	Asp	Asp	Ser	Arg	Trp	Ala	His	Arg	Pro	Arg	Tyr	Asn	Glu	Ala	Leu
	515					520						525			
Tyr	Ala	Gln	Arg	Asn	Asp	Pro	Ser	Thr	Ala	Ala	Gly	Gln	Ile	Tyr	Gln
	530				535						540				
Gly	Leu	Arg	His	Met	Ile	Ala	Val	Arg	Gln	Ser	Asn	Pro	Arg	Phe	Asp
545				550					555						560
Gly	Gly	Arg	Leu	Val	Thr	Phe	Asn	Thr	Asn	Asn	Lys	His	Ile	Ile	Gly
			565					570					575		
Tyr	Ile	Arg	Asn	Asn	Ala	Leu	Leu	Ala	Phe	Gly	Asn	Phe	Ser	Glu	Tyr
		580					585					590			
Pro	Gln	Thr	Val	Thr	Ala	His	Thr	Leu	Gln	Ala	Met	Pro	Phe	Lys	Ala
	595					600					605				
His	Asp	Leu	Ile	Gly	Gly	Lys	Thr	Val	Ser	Leu	Asn	Gln	Asp	Leu	Thr
	610				615					620					
Leu	Gln	Pro	Tyr	Gln	Val	Met	Trp	Leu	Glu	Ile	Ala				
625				630					635						

<210> 6

<211> 27

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: artificial sequence

<400> 6
gtcgacatga accgaaaccg ccatatc

27

<210> 7
<211> 29
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: artificial
sequence

<400> 7
cctgcaggtg tgggtgccgct ttatttggc

29

<210> 8
<211> 7
<212> PRT
<213> Neisseria denitrificans

<400> 8
Met Asn Arg Asn Arg His Ile
1 5

<210> 9
<211> 6
<212> PRT
<213> Neisseria denitrificans

<400> 9
Arg Pro Asp Ala His His
1 5

<210> 10
<211> 7
<212> PRT
<213> Neisseria denitrificans

<400> 10
His Ala Pro Asp Tyr Ala Leu
1 5

<210> 11
<211> 5
<212> PRT
<213> Neisseria denitrificans

<400> 11

Glu Gly Glu Ala Ala
1 5

<210> 12
<211> 5
<212> PRT
<213> *Neisseria denitrificans*

<400> 12
Asp Asp Tyr Arg Phe
1 5

<210> 13
<211> 5
<212> PRT
<213> *Neisseria denitrificans*

<400> 13
Ser Ala Leu Gln His
1 5

<210> 14
<211> 5
<212> PRT
<213> *Neisseria denitrificans*

<400> 14
Tyr Glu Thr Leu Gly
1 5

<210> 15
<211> 5
<212> PRT
<213> *Neisseria denitrificans*

<400> 15
Val Ser Gly Val Arg
1 5

<210> 16
<211> 5
<212> PRT
<213> *Neisseria denitrificans*

<400> 16
Val Ser Val Ile Gly
1 5

<210> 17
<211> 5
<212> PRT
<213> Neisseria denitrificans

<400> 17
Phe Asn Gly Trp Asp
1 5

<210> 18
<211> 5
<212> PRT
<213> Neisseria denitrificans

<400> 18
Leu Tyr Lys Phe Ser
1 5

<210> 19
<211> 5
<212> PRT
<213> Neisseria denitrificans

<400> 19
Pro Tyr Ala Phe Gly
1 5

<210> 20
<211> 6
<212> PRT
<213> Neisseria denitrificans

<400> 20
Arg Pro Thr Thr Ala Ser
1 5

<210> 21
<211> 5
<212> PRT
<213> Neisseria denitrificans

<400> 21
Phe Arg Arg Arg Ala
1 5

<210> 22
<211> 6
<212> PRT
<213> Neisseria denitrificans

<400> 22
Asp Glu Leu Val Asn Tyr
1 5

<210> 23
<211> 6
<212> PRT
<213> Neisseria denitrificans

<400> 23
Leu Pro Leu Ser Glu Tyr
1 5

<210> 24
<211> 6
<212> PRT
<213> Neisseria denitrificans

<400> 24
Tyr Gln Ala Thr Gly Leu
1 5

<210> 25
<211> 5
<212> PRT
<213> Neisseria denitrificans

<400> 25
Asp Asp His Gly Leu
1 5

<210> 26
<211> 5
<212> PRT
<213> Neisseria denitrificans

<400> 26
His Gln Asp Trp Asn
1 5

<210> 27

<211> 5
<212> PRT
<213> Neisseria denitrificans

<400> 27
Asp Gly Ile Arg Val
1 5

<210> 28
<211> 6
<212> PRT
<213> Neisseria denitrificans

<400> 28
Tyr Gly Gly Ser Glu Asn
1 5

<210> 29
<211> 6
<212> PRT
<213> Neisseria denitrificans

<400> 29
Ser Phe Ala Glu Glu Ser
1 5

<210> 30
<211> 5
<212> PRT
<213> Neisseria denitrificans

<400> 30
Asp Pro Val His Arg
1 5

<210> 31
<211> 6
<212> PRT
<213> Neisseria denitrificans

<400> 31
Trp Gln Gln Phe Ala Asn
1 5

<210> 32
<211> 5
<212> PRT

<213> Neisseria denitrificans

<400> 32

Glu Ile Leu Asn Ser
1 5

<210> 33

<211> 8

<212> PRT

<213> Neisseria denitrificans

<400> 33

Ala Thr Glu Ile Gln Thr Ala Leu
1 5

<210> 34

<211> 9

<212> PRT

<213> Neisseria denitrificans

<400> 34

Val Lys Asp Lys Gln Ala Lys Ala Lys
1 5